

## Abstract

A fast single-article megasonic cleaning system (**200**) is used to clean substrates (such as semiconductor wafers, flat panel display glass, etc.) at frequencies of 400 kHz - 20,000 kHz or higher. The technique provides a single-wafer cleaning process that reduces the cleaning time from the 10 - 20 minutes typical of the prior art to 15 - 60 seconds. The system utilizes concentrated megasonic energy on one wafer (**90**) to dramatically reduce cleaning time. The system uses a transducer (**210**) or a pair of transducers (**210a, 210b**) parallel to the substrate (**90**) to be cleaned where the transducer area is more than about 40% of the substrate area. Two alternate configurations are disclosed, one utilizing a horizontal wafer arrangement and the second utilizing a vertical wafer arrangement. The latter requires a smaller floor area. Preferred spacings between the wafer and the transducer, preferred transducer power and intensity, preferred overflow flow rate of fluid medium (**220**) (which may be deionized water), effective cleaning times, and process temperature are disclosed.